

REMARKS

Claims 1-6 and 8-13 were pending. The Final Office Action rejected claims 1-6 and 8-13. According to the Advisory Action of October 13, 2005, entry of the Amendment dated September 27, 2005 was refused.

The present amendment is submitted with a Request for Continued Examination (RCE) and the requisite fee. The present amendment cancels claims 1-6, amends claims 8 and 13, and adds new claim 15. Thus, claims 8-13 and 15 are currently pending.

Rejections under 35 U.S.C. §103

Claims 8-13 were rejected under 35 U.S.C. §103 as being unpatentable over Applicants' alleged admitted prior art (AAPA) in view of U.S. Patent Application Publication No. 2002/0115283 (Ho) and in view of U.S. Patent No. 6,706,166 to Chou et al. (Chou). Additionally, claims 1-6 and 8-13 were rejected under 35 U.S.C. §103 as being unpatentable over AAPA in view of Ho and U.S. Patent No. 6,176,992 to Talieh (Talieh). Applicant respectfully requests reconsideration.

The Office Action failed to establish a prima facie case that either the hypothetical combination of AAPA, Ho, and Chou, or the hypothetical combination of AAPA, Ho, and Talieh, renders claim 8 unpatentable. In particular, the Office Action failed to establish that the hypothetical combinations of AAPA, Ho, and Chou and AAPA, Ho, and Talieh teach, disclose or suggests all the elements of the claims.

Claim 8 is directed generally to a method of forming a copper wiring in a semiconductor device. Claim 8 has been amended and now recites, *inter alia*, "performing a copper electroplating process in an electroplating apparatus to fill the damascene patterns with a copper layer by applying a negative (-) power supply to the substrate," "performing a copper electro-polishing process to polish the copper layer and the copper seed layer on the interlayer insulating film by applying a positive (+) power supply to the copper layer and the copper barrier layer on the interlayer insulating film so that the copper electro-polishing process is automatically stopped when the copper barrier metal layer is exposed," and "polishing the copper barrier metal layer on the interlayer insulating film by means of a

chemical mechanical polishing process until the surface of the interlayer insulating film is exposed.”

None of the applied references, neither alone nor in combination, teaches, discloses, or suggests the combination of elements recited in claim 8. The Final Office Action admitted that the AAPA does not disclose polishing the copper layer by means of a copper electro-polishing process. The Final Office Action alleged that, Ho discloses polishing the copper layer by means of a copper electro-polishing process. The Final Office Action then alleged that Chou “discloses utilizing a single apparatus to perform an electroplating process and an electro polishing process by changing the negative power supply to a positive power supply.” *Final Office Action* at p. 8. Additionally, the Office Action alleged that “Talieh discloses utilizing a single apparatus to perform an electroplating process and an electro polishing process by changing the negative power supply to a positive power supply.” *Final Office Action* at pp. 16-17.

But none of the applied references, neither alone nor in combination, teaches, discloses or suggests the combination of “performing a copper electroplating process in an electroplating apparatus to fill the damascene patterns with a copper layer by applying a negative (-) power supply to the substrate,” “performing a copper electro-polishing process to polish the copper layer and the copper seed layer on the interlayer insulating film by applying a positive (+) power supply to the copper layer and the copper barrier layer on the interlayer insulating film so that the copper electro-polishing process is automatically stopped when the copper barrier metal layer is exposed,” and “polishing the copper barrier metal layer on the interlayer insulating film by means of a chemical mechanical polishing process until the surface of the interlayer insulating film is exposed.”

For example, Ho merely states that a Cu layer is planarized using an Electro-Dissolution Polish (EDP) method, and then CMP may be used to remove a barrier layer. But Ho is silent regarding exactly when the EDP method is stopped.

Chou describes reversing an applied potential in sign during an electroplating process during deposition to cause an electro-polishing process during the deposition. Chou appears to be silent regarding when the electro-polishing process should be stopped. Further,

Chou does not describe using the EDP method to polish a Cu layer, and then using CMP to polish a barrier layer.

Talieh describes applying a negative potential to a cathode and a positive potential to an anode during a deposition process. During the deposition process, mechanical polishing is performed. Next, the polarities of a cathode and an anode are reversed during a seed layer electro-polishing step. Talieh appears to be silent regarding when the electro-polishing process should be stopped. Further, Chou does not describe using the electro-polishing process to polish a Cu layer, and then using CMP to polish a barrier layer. On the contrary, Talieh describes using mechanical polishing during metal deposition, and then using electro-polishing to polish a seed layer.

Thus, none of the applied references, neither alone nor in combination, teach, disclose, or suggest all the elements of claim 8. Accordingly, reconsideration of the rejection is respectfully requested.

In view of the above amendment, Applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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